Method and Apparatus for the Rewinding of a Thread Group

BACKGROUND OF THE INVENTION

[0001] This invention relates to a method for the rewinding of a thread group. In a method of this kind, the warp sections previously wound onto the warping drum section by section are wound jointly onto the warp beam in order to produce the warp. In the case of the cone-type warping machine, this is possible only by means of an axially parallel relative displacement between the warping drum and the warp beam, because the relative position of the thread structure changes with a decreasing winding diameter.

[0002] A comparable generic rewinding method became known, for example, from DE 43 04 955. Clearly, during rewinding, a defined thread tensile force must be maintained in order to prevent distortions of the threads on the warp beam. Depending on the material property of the individual threads to be processed, this tensile force reaches such high values that the deadweight of the machines is no longer sufficient to hold them on the ground. The tilting moment caused by the thread tensile force may in this case suffice, for example, to lift the cone-type warping machine out of the rail mounting on one side. In order to avoid this, the warping drum stand has hitherto been loaded with weights, for example in the form of steel plates.

[0003] The additional weight load, on the one hand, gives rise to considerable material costs, and it increases the mass inertia of the machine to be displaced. Moreover, it would be desirable to operate a specific machine over a broad tensile force range, without additional measures being necessary for this purpose.

SUMMARY OF THE INVENTION

[0004] One object of the invention, therefore, is to provide a method of the type initially mentioned, with the aid of which high thread tensile forces can be adopted during rewinding, without the risk of the machine tilting or without the latter having to be loaded with additional weights. This object is achieved, according to the invention, by the method described below.

[0005] The mutual support of the two machines entails only a small extra outlay in terms of construction, but, with a suitable arrangement, makes it possible to employ very high tensile forces, without the mounting of the machines being influenced by such forces. As a rule, in this case, the warping stand is displaced on rails in relation to the fixed beaming stand, and, moreover, it is advantageous if the support preferably takes place approximately at the horizontal plane of the warping drum axis or above the latter. In specific instances, of course, it would also be conceivable to displace the beaming stand in relation to the warping stand.

[0006] An additional advantage can be achieved via the support when the latter takes place via a force measurement device which generates a measurement signal corresponding to the tensile force in the thread group, and when the braking force at the warping drum is preferably regulated with the aid of the measurement signal. In conventional apparatuses, a measuring roller, around which the thread group is partially looped, is used for tensile force measurement. However, the effective looping angle is variable, depending on the running angle of the thread group. Via the force measurement device on the support, looping-free force measurement subjected to little mass inertia becomes possible for regulating the warp tension.

[0007] Advantageously, rewinding takes place from the vertex line of the warping drum to the vertex line of the warp beam, without a deflecting roller. However, this type of rewinding presupposes that the individual warp sections are wound over the baseline of the warping drum. By the deflecting roller being omitted, a further disturbing variable which could influence the quality of the warp beam can be eliminated.

[0008] Very high warp tensile forces can be adopted if the warping drum is braked by means of at least two, preferably by means of at least four, brake disks, each of which is equipped with at least two brake grippers, and if the brake grippers are activated or deactivated sequentially in succession as a function of the necessary braking capacity. In the high load range, in this case, the braking forces are distributed to all the active brake disks, as a result of which, moreover, the useful life of the disks is prolonged.

[0009] The invention also relates to an apparatus for rewinding a thread group. The support in this case takes place advantageously at at least two supporting bearings preferably provided with rolling bearings. Friction is thereby kept as low as possible. In specific applications, however, the use of plain bearings could also be envisaged.

[0010] A particularly advantageous support is obtained when the distance between the at least two supporting bearings is equal to or greater than the maximum useful width (cylindrical portion plus conical portion) of the warping drum. Undesirable additional forces are reliably avoided thereby.

[0011] The supporting bearings may be provided with a force measurement device for measuring the tensile force in the thread group which corresponds to a defined pressure force. Force measurement sensors reacting to pressure are available as standard for various measurement ranges. The force measurement device is preferably operatively connected to the braking device at the warping drum in order to regulate the tensile force in the thread group. It would also be conceivable, however, to have a straightforward measurement and recording of the tensile forces, so that, for each warp beam, a log of its state can be drawn up.

[0012] The support on the warping drum stand mounted on rails advantageously takes place approximately at the horizontal plane of the warping drum axis or above the latter. In this case, a particularly advantageous parallelogram of forces is obtained.

[0013] Moreover, the support may be provided with an emergency stop device for interrupting the relative displacement between the warping stand and the beaming stand when a predetermined resistance is exceeded.

[0014] According to a further safety measure, the support takes place at at least two supporting bearings which are designed as barriers for shutting off the interspace between the beaming stand and the warping stand. The supporting bearings thereby prevent access to the interspace.

[0015] So that above-average high thread tensile forces or winding performances can be adopted, it is expedient if the braking device at the warping drum has at least four brake disks, each of which is provided with at least two brake grippers. Admittedly, a higher braking force could also be achieved by an increase in diameter of the existing brake disks. However, for reasons of space, an increase of this kind is not arbitrarily possible. Depending on the application, it could also be advantageous to arrange additional brake disks on conventional apparatuses for rewinding a thread group.

[0016] It is particularly expedient if two brake disks are arranged in each case on each side of the warping drum, and if in each case the outer brake disks are fastened on the warping drum axis so as to be releasable from outside. This design makes it possible subsequently to set up an existing warping machine for use with higher warp tensile forces.

[0017] It is expedient, moreover, if the brake grippers on the brake disk are located preferably diametrically opposite one to another, and if the pairs of brake grippers of adjacent brake disks are arranged so as to be offset angularly to one another. This results in a very small constructional width and good access to the brake grippers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Further advantages and individual features of the invention may be gathered from the following description of an exemplary embodiment and from the drawings, in which:

Figure 1 is a top view of an apparatus according to the invention in a highly diagrammatical illustration,

Figure 2 is a side view of the apparatus according to figure 1,

Figure 3 is a side view of a supporting bearing between the warping stand and the beaming stand,

Figure 4 is a top view of the supporting bearing according to figure 3,

Figure 5 is a view of the braking device, as seen in the direction of the warping drum axis, and

Figure 6 is a top view of a braking device on one side of the warping drum.

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0019] As is evident from figures 1 and 2, the rewinding apparatus consists essentially of a cone-type warping machine 1 and of a beaming machine 2. The cone-type warping machine has a warping drum 5 which has a cone portion 19 and which is mounted rotatably in a warping stand 4. The warping stand 4 is mounted on rails 8 on the foundation 30 and can be displaced in the direction B of the warping drum axis 9.

[0020] Via the warping support 18, individual warp sections 36 have previously been wound in a known way, following the cone slant, onto the warping drum 5 until a warp package 37 is completed.

[0021] This warp package is subsequently rewound as a whole, as a thread group 3, onto the warp beam 7 of the beaming machine 2. In this case, as is evident, the warp beam 7 is driven, while the warping drum 5 is braked with the aid of a braking device 13 in order to maintain a tensile force. The braking device preferably consists of altogether four brake disks 15a, 15b, 15a', 15b', each of which has at least two brake grippers.

[0022] The warp beam 7 is mounted in a beaming stand 6 which, however, in contrast to the warping stand, is anchored firmly on the foundation 30. The beaming disks, 20, 20' can be adapted to the respective useful width of the thread group 3, a maximum useful width D2 being possible.

[0023] During rewinding, the warping stand is displaced in the direction of the arrow B on the rails 8 in order to compensate the cone slant in the case of a decreasing package circumference. During this displacement, the warping stand 4 is supported on the beaming stand with the aid of two supporting bearings 14, 14'. The distance D1 between the two supporting bearings is in this case greater than maximum useful width D2.

[0024] As is evident particularly from figure 2, the supporting bearings 14 lie approximately at the horizontal plane of the warping drum axis 9 or slightly above the latter. Rewinding takes place from the vertex line 34 of the warping drum 5 onto the vertex line 35 of the warp beam 7. A deflecting roller 12 may also optionally be used in this case. Clearly, in this overall arrangement, a tilting of the warping stand 4 is no longer possible, even without additional weight loading, because the tilting moment is absorbed at the supporting bearings. The warp beam axis 10 and the warping drum axis 9 must, of course, be oriented exactly parallel to one another.

[0025] Details of the supporting bearings may be gathered from figures 3 and 4. Each bearing is screwed to the warping stand 4 with the aid of a connecting plate 24. The actual support takes place on a rolling bearing, for example on a needle bearing 21, the outer raceway of which rolls on a supporting strip 22 which is fastened to the beaming stand 4. The feed of the rolling bearing is in this case carried out in an adjustable way via a setting device 23. The pressure force acting on the supporting bearing 14 may be determined in a known way via a force measurement device 11. As regards the known geometry between the supporting bearings and the thread group, the effective tension in the thread group can be measured permanently via this measurement signal.

[0026] Moreover, in the region of the rolling bearing 21, an emergency stop device 17 may be provided, which reacts to a resistance force transversely to the direction of advance of the warping stand 4 and which interrupts the advance or the rewinding process. For this purpose, the supporting bearing 14 is surrounded by a housing 25 which is pivotable in the direction of the arrow C in relation to the connecting plate 24 about a pivot axis 16. The housing is in this case held in a neutral position by springs 40 arranged on both sides. In this middle position, a trip cam 38 assigned to the connecting plate 24 lies in the depression of a trip link 39 which is assigned to the housing 25.

[0027] The housing 25 also serves for protecting the supporting bearings against contamination. Moreover, the housing, together with the connecting plate 24, forms a kind of barrier which shuts off the theoretically possible access to the interspace.

[0028] If, then, for example, the housing 25 strikes an obstacle during the relative displacement of the warping stand, an outward pivoting into the position marked by dashes and dots in figure 4 takes place. In this case, the trip cam 38 moves down the trip link 39, thus triggering a switching operation which switches off the machine.

[0029] Figures 5 and 6 show details of the braking devices 13 on the sides of the warping drum 5. The latter is mounted at both ends at the warping drum bearings 26. Arranged in each case next to a first inner brake disk 15a is in each case a second outer brake disk 15b. The latter can subsequently be mounted onto a bearing journal 27, specifically with the aid of a clamping bush 28.

[0030] Each brake disk is assigned a brake gripper bearing 31a and 31b which can receive two brake grippers 32 preferably located diametrically opposite one another. As is evident particularly from figure 5, the brake gripper bearings of adjacent brake disks are arranged to be offset angularly to one another, in order to make it possible to have as small a construction width as possible.

[0031] The running wheels 29 which roll on the rails 8 can also be seen in figure 5. Advance takes place via a drive motor 33.

[0032] With this invention, warp beam tensions of up to approximately 30,000 N may be adopted, depending on the yarn quality. Two brake disks, each with two brake grippers, are sufficient for lower warp beam tensions. For higher tensions, the additional disks can be mounted, as described above. Motor powers of up to approximately 60 kW are necessary for the maximum warp tensions specified.